

## TI7707 FIELD TESTING OF CURRENT TRANSFORMER OPERATED METERS

### 1. CUSTOMER RELATIONS

#### 1.1 General

All aspects of customer relations are covered in the appropriate Area Branch Standing Instructions (Nos. 1005, 1005, 1007, 1026 and 1027). Observance of these instructions will ensure that officers of Area Branches continue to enhance the good standing which the Council has with the public generally.

Courtesy and friendliness in dealing with the public are fundamental requirements.

Good appearance in dress and a pleasant manner combined with an air of efficiency are to be maintained at all times. Whilst metering coming within the scope of this instruction incorporates test blocks which allow for testing procedures to be carried out without interruption to supply or other inconvenience to the customer it is common courtesy to inform the customer, or his representative before commencing any work on the premises.

#### 1.2 Test Results

Employees involved with the testing of meters and metering equipment or the investigation of queries, whether at the instigation of the customer or the Customer Account Branch are not permitted to divulge the results of such tests. It is realised that at times the tactful refusal to divulge such information may prove to be difficult and the following suggestions are given only as a guide.

##### 1.2(a) Customer Queries

Courteously inform the customer that Council will make the results known by letter.

##### 1.2(b) All Other Tests

Inform the customer that a routine test and inspection of the metering is being carried out. If on completion of the tests the customer requests information regarding the results, inform them that all results are subject to computer analysis.

#### 1.3 Other Information

Council officers are frequently confronted with questions related to other Council services and activities outside their own sphere of activity. Where the officer is absolutely certain that he can supply the customer with the correct information he should do so. However, if he has any doubts he should advise the customer to contact the most convenient Council showroom, or to telephone the Council General Business or Account Enquiries number as appropriate and explain the nature of the enquiry to the telephonist who will connect the customer to the appropriate officer.

#### 1.4 Defects in Customer's Installation

Generally, Council staff visiting customer's premises to test meters shall confine their activities to testing meters. However, obvious defects or deterioration in switchboard wiring or equipment should be reported to the supervisor who will arrange for the matter to be referred to the appropriate sub section for attention.

- 1.4(a) Where a defect is encountered which constitutes an immediate hazard to life or property it shall be isolated, the customer informed and the matter reported immediately by telephone to the Emergency Services Section.

### 2. General Requirements Related to CT Operated Meters

#### 2.1 Frequency of Testing

A number of factors influence Council policy in relation to the testing and maintenance of metering equipment. Because of the additional complexity of metering involving the use of current transformers and in the types of equipment used in many cases, a more complex system of guidelines is necessary. Technical Instruction 7752 "Periodic Maintenance of Meters and Metering Equipment" which forms part of Volume 2 of the Technical Instruction Manual of "Field Meter Testing" should be used as the guideline in determining requirements.

#### 2.2 Types of Tests

(a) Sample testing will be carried out on a small number of meters representative of a larger group, each with the same basic characteristics, so that surveillance of the performance of the complete category is achieved.

(b) Investigation testing will be carried out and the results used to evaluate individual characteristics or deficiencies when required.

(c) Programmed testing may be carried out when indicated by the analysis of sample and investigation tests which show the need for further attention to a complete category of meters.

(d) Query testing will be carried out when requested, and the requisite fee paid by the customer, generally when the account appears excessive, or when the Customer Accounts Branch requests a test because it considers the meter reading may not be truly reflecting consumption.

Note: It may well be the case that sufficient query tests may have been performed over a given period of time to obviate the need to carry out sample testing of a particular category of instrument, or at least reduce the number of meters to be sample tested.

(e) Testing of current transformers is not normally required in the field apart from those tests carried out at initial installation or commissioning to ensure that the ratio of transformation is as indicated and that polarity markings are correct.

### 2.3 Selection of Equipment

With some exceptions where special requirements exist, Council policy is to employ only magnetic suspension meters where Ferraris type instruments are used. However, some meters may be found in service which do not comply with this policy and are to be changed when identified in the field. Only long range instruments are to be used. Present purchases of meters for CT connection are generally rated at  $2\frac{1}{2}/15A$  but meters are in service having various other ranges such as  $2\frac{1}{2}/7\frac{1}{2}A$ ,  $2\frac{1}{2}/10A$  etc. All of these are placed in the general category of "5Amp C.T. METERS". All meters in this category must have a "K" tag displayed on the front of the instrument indicating the reading multiplication factor or "constant" which is derived from the ratio "constant" which is derived from the ratio of the C.T. The choice of meter will also depend to some extent on the type of C.T. to which it will be connected. Where extended range C.T. are employed only  $2\frac{1}{2}/15A$  meters are to be used.  $2\frac{1}{2}/10A$  meters may be used only with multi-range C.Ts. (types A.B.C.) The individual selection of the C.Ts themselves goes beyond the scope of this instruction and is dealt with in Technical Instruction Manual "Meter Installation, Vol.2" (TI7332).

A few meters are still in service which do not conform with Council policy in that no reading constant is used, the ratio of transformation and thus the constant has been built into the register and actual energy consumption is displayed without the need for applying a reading constant. These are classified as "6AMP C.T. METERS" to distinguish them from the standard "5AMP C.T. METER" in computer records and are to be changed when identified in the field.

Where space is not a limiting factor and no special requirement is created because of the tariff to be applied, single phase CT meters will be used. The special tariffs (i.e. Demand etc) it will be necessary to use polyphase meters as will also be the case where space limitations make the installation of single phase meters impractical. It may be found that where loads with "poor" power factors exist such as where "single phase" equipment is connected across 415 volts (as is the case where some types of welding equipment is installed) reversal of one single phase meter out of two or three installed may occur. This can sometimes be rectified by rearrangement of circuits to ensure that "good" power factor loading (i.e. lighting) is transferred to the affected phase and thus ensure "positive" or forward registration. Where this is not possible to achieve it may become necessary to remove the single phase meters and install a polyphase replacement. Generally, single phase meters will be installed at the outset and in the event of a meter reversal occurring such remedial action as may be appropriate to the circumstances will be carried out where a problem installation is identified.

### 3. C.T. Test Kit (Low Voltage)

#### 3.1 Description

This test equipment is designed to permit the testing of all low voltage, current transformer connected meters whether single phase or polyphase testing of meters where applicable.

The equipment basically consists of three units within a wooden box, each of which can be controlled by a common switched variable phantom loading arrangement and has an individual rotating standard watt-hour meter for each phase and the necessary switches, leads etc. Because of its mass this equipment will require a two man team to carry out testing operations.

The leads provided as part of the test kit, together with the movable links etc in the CT test block allow for complete testing to be carried out on the installation without interruption to the supply to the customer. No wiring has to be disconnected and after bridging of the individual current transformers at the test block the meters can be readily isolated for testing by opening of links in the test block. All connections of leads from the test kit are by means of "banana" plugs and unlike the test kit used for direct connected meters no changing of leads is required when carrying out "power factor" (0.5LAG) tests, this being done by simple switching arrangements incorporated in the test kit rather than by rearrangement of external leads. A phase sequence indicator of the static neon indicator type is also incorporated in the kit housing.

Test load selection is provided by a nine position switch for the following loads

0.25 AMPS	5.0 AMPS
0.5 AMPS	5.5 AMPS
1.25 AMPS	7.5 AMPS
2.5 AMPS	10 AMPS
3.75 AMPS	

A second switch allows the selection of unity Power Factor, OFF, or 0.5LAG whilst a third switch allows for clockwise or anti-clockwise phase sequence for use in testing of polyphase meters. (Whilst meters should always be connected "anti-clockwise" it may be found necessary to take "as found" tests of a meter which has been connected incorrectly. Individual switches are also provided for the isolation of potentials to the rotaries. Indicating lights, clearly identified, provide indication of voltages available etc. To assist in making connections correctly when using the kit all leads are colour coded (red, white or yellow, blue) for potentials and the pairs of secondary load leads are colour coded with an additional length of white sleeving placed over the non potential leads. All connections are made by use of banana plug inserted into sockets in the test block which is provided with links for isolating the CT secondaries from the meters after the CT bridges have been inserted.

### 3.2 Test Procedure Single Phase Meters

The Technician shall:-

(a) On arrival at the premises inform customer or his representative of his presence and the reason for the visit.

(b) Check meter details against the information provided on the test card or other Council documentation and where any errors are detected these shall be noted, in the case of the test card, in the "Remarks" section. Where information is incorrectly printed it shall not be erased but a single line drawn through it and the correct information inserted above or below the original. (Metering Services B.S.I. 1500 Appendix "L" refers).

(c) If the meter has a metal case prove with test lamps that the case is not "alive".

(d) Wipe the dust from exposed surfaces of the meter and check for illegal interference. Where it is evident that equipment has been interfered with and that the customer is, or has been, taking supply which is not being correctly registered, do not continue with any further inspection. Contact the Supervisor as soon as possible. If the Supervisor is not available, request a fellow employee to witness the installation "as found". In any case the customer's attention shall not be drawn to the apparent interference. No remedial action shall be taken until the matter has been investigated by the Area Branch.

(e) Cut the seals and remove the cover of the test block and the terminal covers of meters to be tested. Test between CT secondary load conductors and a known earth with test lamps to prove that no voltage is present indicating a fault condition on the CT or secondary wiring. Do not attempt to work on any secondary conductor which proves "live" until the fault condition has been isolated and rectified. Prove that active and neutral conductors are correct using approved test lamps. In the case of polyphase meters ensure that all polarities are correct.

(f) Bridge CT secondary load at the test block by inserting the approved bridging device above the current links of the test block and open each current link. Read meter/s and record results.

(g) Check all connections in test block and meter terminal block for tightness.

(h) Ensure that all switches of the test kit are "off" and then make connections as follows

(a) lines "RED", "YELLOW", "BLUE"

(b) loads RED POLARITY AND NON POLARITY  
YELLOW POLARITY AND NON POLARITY  
BLUE POLARITY AND NON POLARITY

(i) When all ten connections have been completed check phase sequence by use of the built in phase sequence indicator. Phase sequence should appear as "anti-clockwise" for three phase installations and "clockwise" for two phase situations.

(j) Apply load of 0.25 amps at unity P.F to the meter and determine the meter error for a minimum of 2 disc revolutions. Record the "as found" error on the Meter Test Card.

(k) Apply load of 5 amps at unity P.F to the meter and determine the meter error for a minimum of 10 disc revolutions or such additional disc revolutions required to ensure that at least 5 revolutions of the rotary should take place. Record the "as found" error.

(l) Repeat the test in (k) above with load at 0.5 lag. Record the "as found" error.

(m) Check the results against the limits specified in table and determine whether the meter is to be changed, adjusted or left "as found". It should be noted that no adjustment to the power factor correction will be carried out in the field where single phase meters are involved. It may be possible to use the limits of the heavy load to correct small discrepancies in power factor results.

(n) Where a meter cover has been removed for any reason, after the cover has been replaced a further test shall be carried out to ensure that the "as left" figure remains substantially correct and no adverse effect has been created by replacement of the cover.

(o) Check the meter for creep by applying only rated voltage and observe that the meter disc does not continue to rotate more than one revolution. Where a meter is found to be "creeping" it will be changed.

(p) Upon completion of testing, disconnect test equipment, reclose links in test block, remove bridges in CT circuit, replace covers and seals.

(q) Remove all used seals, wire etc. from customer's premises.